

**EXCALIBUR:
A Multi-Function Fuze
For a Multi-Purpose Warhead**

EXCALIBUR



XM982



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KDI Precision Products, Inc.

Raytheon

Presentation Outline



- **Excalibur Development History**
- **Application**
- **Fuze Design Goals**
- **Design Approach**
 - ✧ **Fuze Safe & Arm Device (FSA)**
 - ✧ **Proximity (HOB) Sensor**
- **System Integration**



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Excalibur Development History



- **Raytheon Developed XM982 GPS-Guided Munition**
 - ✧ Originally Intended as DPICM Round
 - ✧ Equipped with KDI S&A
- **Lethality Study Showed the Benefits of Unitary Warhead**
 - ✧ Decision Was Made to Convert XM982 to Unitary
 - ✧ Proximity Fuze Provides Maximum Lethality



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Excalibur Development History



- **KDI Selected To Design HOB Sensor**
 - ✧ Established Member of Design Team
 - ✧ Strong Background in Proximity Fuze Design
 - ✧ Several Successful Prox Programs
 - ◆ M734A1, MOFA (Army)
 - ◆ MK417, MK418, MK404 (Navy)
 - ◆ FMU-160/B (AFSOC)



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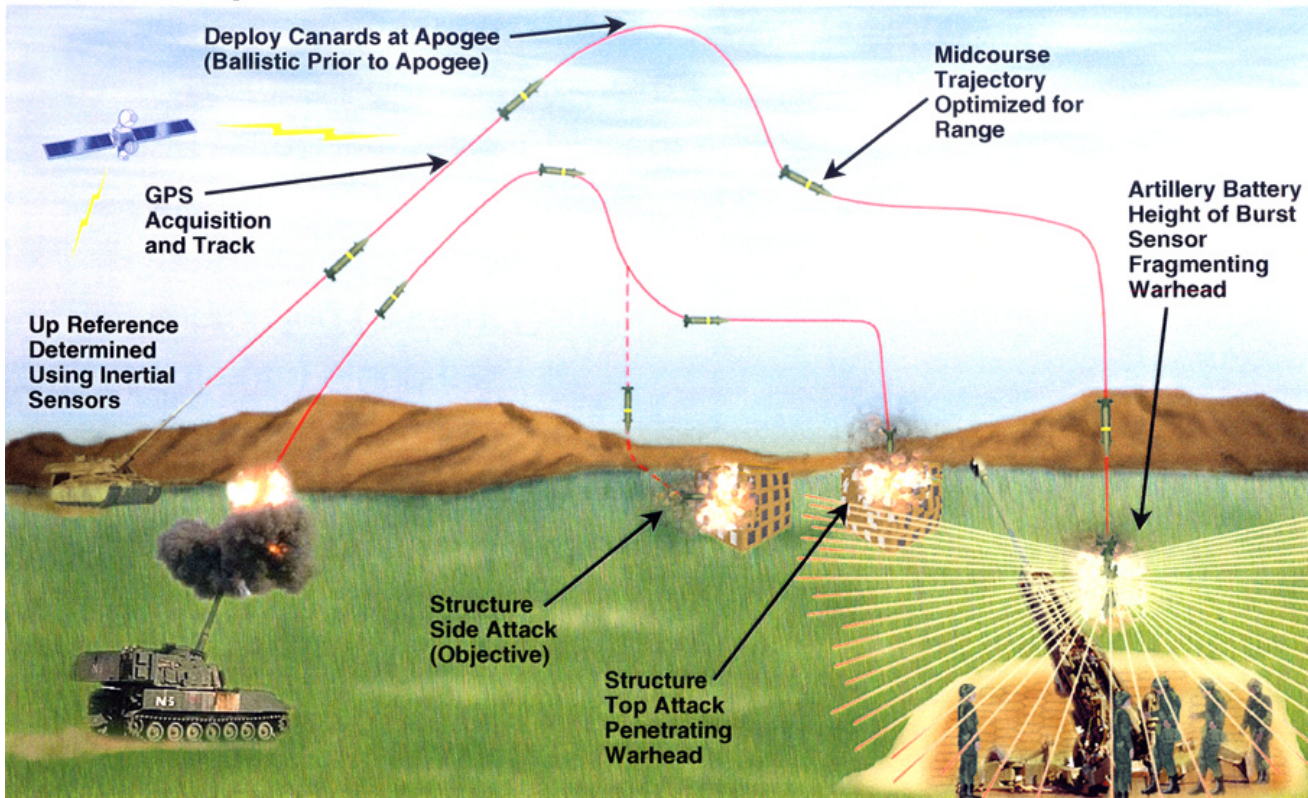
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Application

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Concept of Operations

Unitary Warhead Proposal - 1.0 Introduction



Our Unitary Warhead XM982 Is Designed To Meet User Needs



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Fuze Design Goals



- **Selectable Modes: HOB, PD, PD-Delay**
- **Tight HOB Control**
 - ✧ **Nominal HOB = 15 ft**
- **High Reliability**
- **Maximum Commonality to Existing Designs**
 - ✧ **Proven Reliability**
 - ✧ **Reduced Risk**
 - ✧ **Reduced Cost**



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FSA Design Approach



➤ Similar to XM982 FSA

- ✧ Electrical Contacts Redesigned
- ✧ Transfer Lead Charge Added
- ✧ Electronics Integrated With Mechanical Assembly
- ✧ FPGA-Based Logic
- ✧ Requires Setback (1200 g's Min)
- ✧ Second Environment Under Study
- ✧ Two Fire Command Inputs (HOB, PD)
 - ◆ PD Sensor Located in FSA
- ✧ Electronic Delay



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FSA

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CONTACT BOARD
ASSEMBLY

SETBACK MECHANISM

MAL ASSEMBLY
PREVENTION
FEATURE

PISTON
ACTUATOR

SECOND ROTOR
LOCK



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HOB Sensor Design Approach



➤ Antenna

✧ Circular Patch

- ◆ Easy to Manufacture
- ◆ Broadband
- ◆ Low Cost
- ◆ Rugged
- ◆ Currently Used on FMU-160/B

➤ Radome

- ✧ Material (PEEK) Selected for Mechanical and RF Properties



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HOB Sensor Design Approach



➤ RF Front End

- ✧ GaAs Monolithic Microwave I.C. (MMIC)
- ✧ Developed For M734A1 Multi-Option Fuze for Mortars
- ✧ Successfully Deployed on FMU-160/B
- ✧ Single Chip System
 - ◆ Extremely Rugged
 - ◆ Miniature
 - ◆ Reliable



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HOB Sensor Design Approach



- **Signal Processor**
 - ✧ Used on M734A1 and FMU-160/B
 - ✧ Utilizes DDR Technology
 - ◆ Accurate HOB Control
 - ◆ Robust Anti-jamming Performance
- **Highly Integrated**
 - ✧ Single Chip Solution
 - ✧ High Reliability
 - ✧ Low Cost



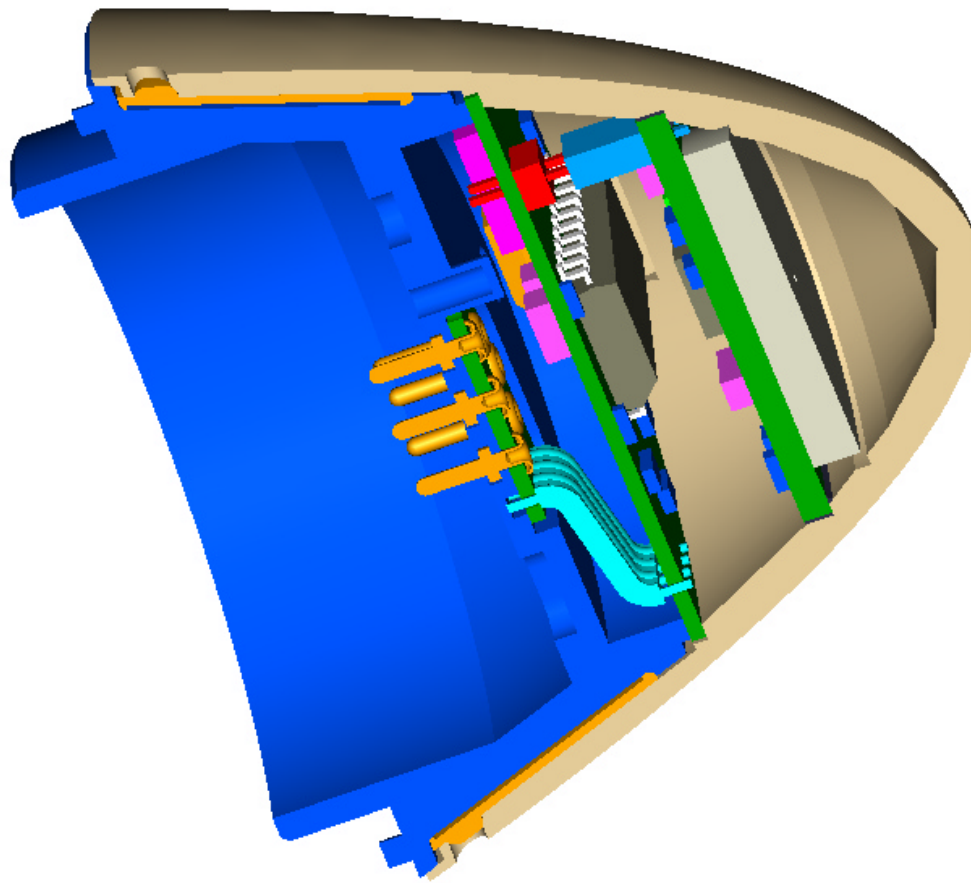
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HOB Sensor Cross Section

EXCALIBUR

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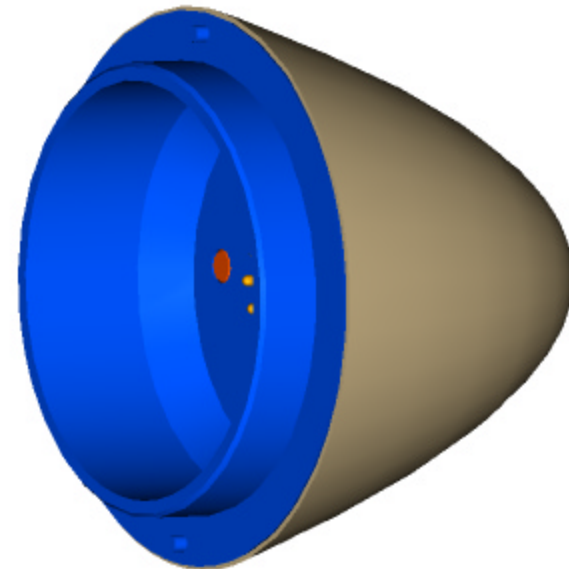
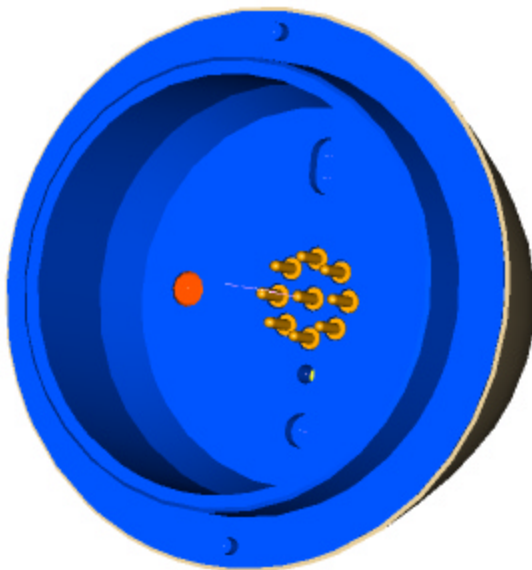
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Interface



- **9-Pin Connector**
- **Carries Power, Target Detect, and Test Signals**
- **Easy to Assemble**



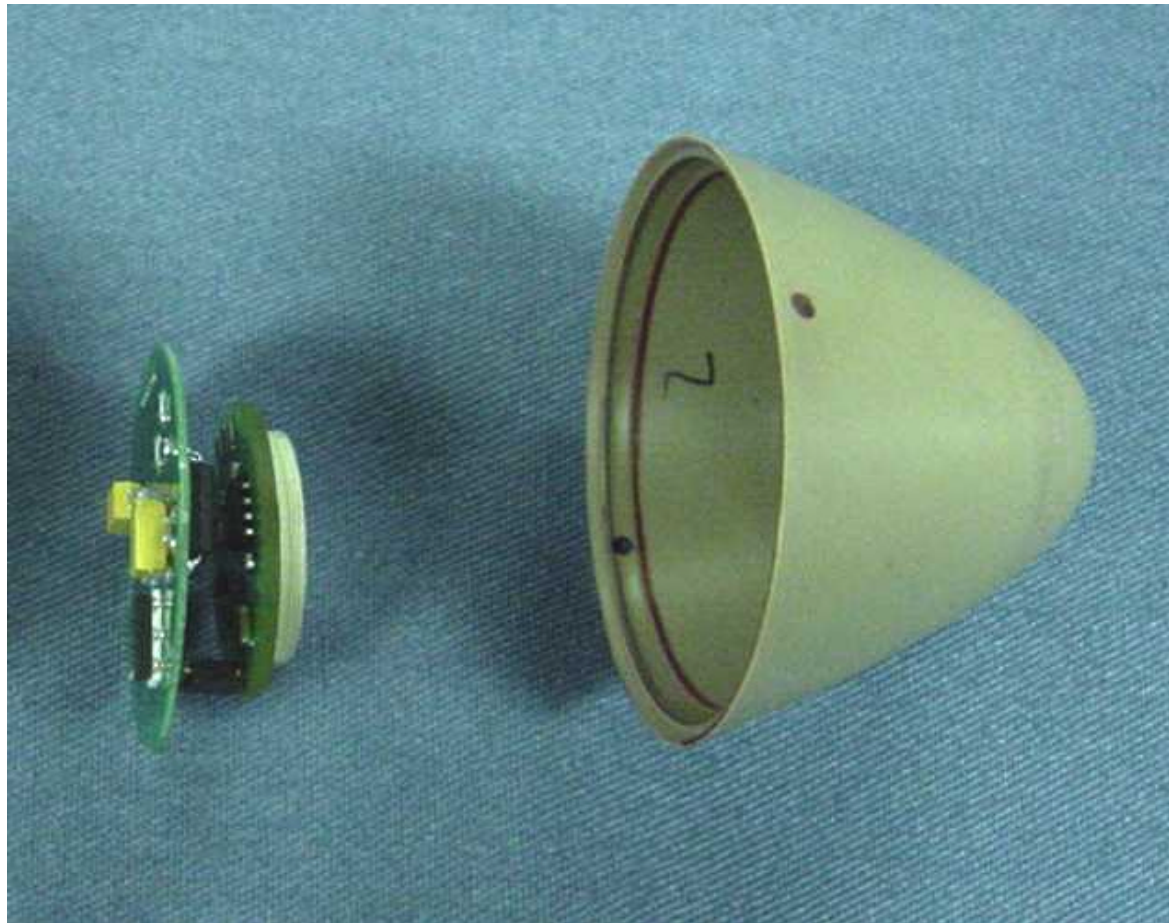
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HOB Sensor

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System Integration

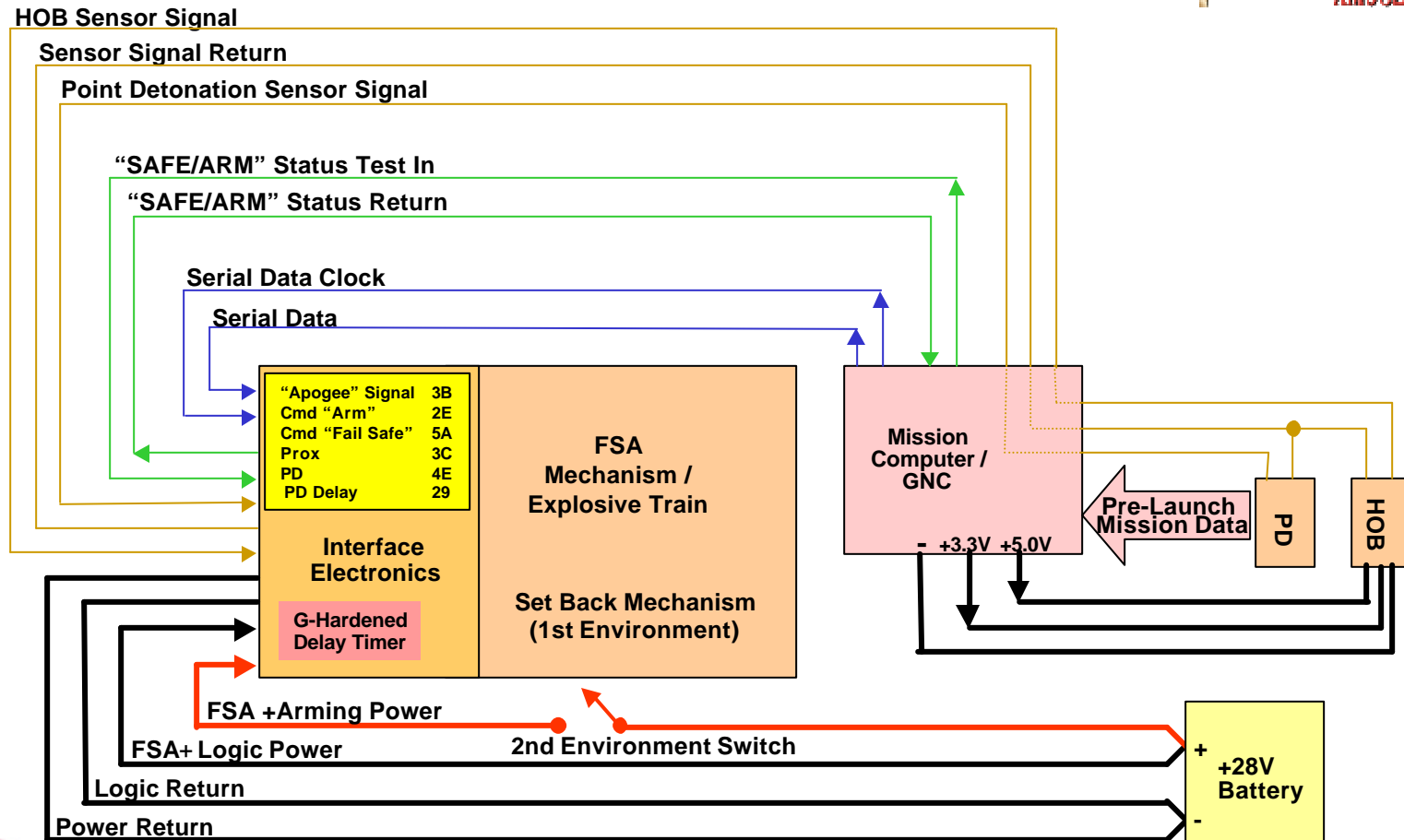


- **Mission Data Stored in Mission Computer**
 - ◆ GPS Coordinates & Fuze Operating Mode
- **Mission Computer Interfaces With FSA**
 - ✧ Supplies Operating Mode Information
- **Power Conditioning Unit (PCU) Supplies Power For HOB Sensor**
- **FSA Receives Prox Fire Command From HOB Sensor**
 - ✧ Ignores HOB Input When Set For PD or PD-Delay



System Block Diagram

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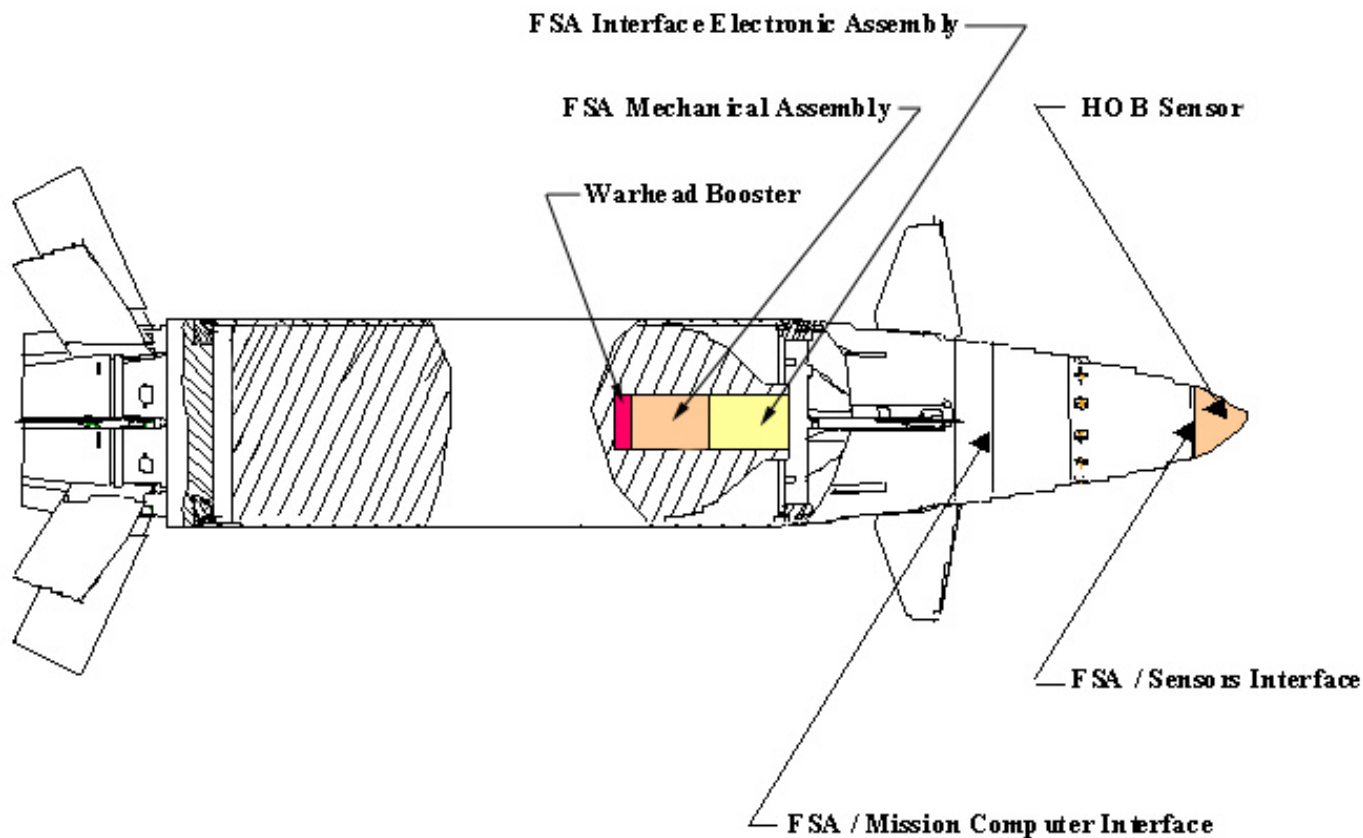
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Excalibur Projectile

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